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*One of the
Handy Dog Booklet Series*

ANATOMY of the DOG

By CAPT. WILL JUDY

Editor of Dog World Magazine, Author of The Dog Encyclopedia, Training the Dog, Care of the Dog, Kennel Building and Plans, Principles of Dog Breeding, and Sirius Series

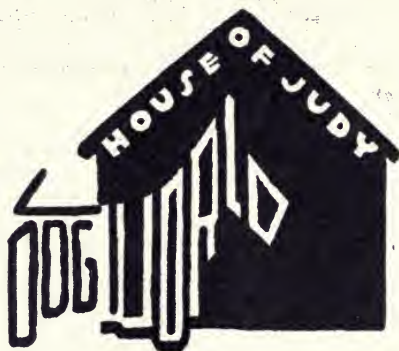


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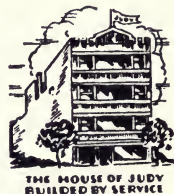
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ANATOMY OF THE DOG

INTRODUCTION

The dog, being a member of the larger canine group, Canidae, is a mammal, and so of the highest class of the vertebrate or backbone group. His species is *canis familiaris* to distinguish him from other species of the Canidae, namely wolf, fox, jackal. The Canidae in turn are one of the 8 species of carnivora or flesh-eating genus of mammals. A dog is not greatly different from the human animal except of course that the dog walks on four legs, is horizontal instead of upright in build, and does not have as many vices.

The dog as a patient is readily responsive to medical and surgical treatment; and because of the similarity in anatomy, human and canine surgery have much in common. The dog does not inflict upon us the bromide, "Now let me tell you about my operation."

Uniformity amid Vast Variety

Perhaps the first consideration which comes to mind is the wide variety of breeds with their differing sizes, shapes, colors, and expressions. Yet there is precise uniformity in structure and functioning of the canine body.

The dog is a dog the world around whatever the breed, whether mongrel or pedigreed. The 200-pound St. Bernard can shake paws with the 2-pound chihuahua and say truly "howdy, brother," for both are true brothers under the skin. In the United States, 109 different breeds are officially recognized; there are approximately 10 distinct but unrecognized breeds; and in other countries there are fully an additional 100 distinct pure breeds of dogs.

The study of the anatomy of one breed is sufficient for a correct understanding of that of any other breed. From the long muzzle of the borzoi to the smashed-in nose of the pekinese, from the slender lines of the greyhound to the massiveness of the St. Bernard, from the height of the great dane to the lowness of the dachshund, there is full similarity in bone structure, organ functions, and of course, in personality and character.

Aims of this Work

The presentation of the anatomy of the dog is designed entirely for the layman; nevertheless it must be wholly accurate and basically complete. The difference can lie only in the method and extent of presentation.

However, the reader must not conclude after he has finished reading this work that he can act with professional ability as a veterinary surgeon. That would be a disastrous conclusion.

This work is intended not in any way to displace the need for a veterinarian's services but to give the dog breeder and the dog owner an elementary or basic knowledge of anatomy in order better to understand the care of the dog and the conformation or fitting-together of the various parts of the dog. The latter is particularly helpful in interpreting the breed standard in the show ring.

A Definition of Anatomy

What is anatomy? What does anatomy include? The word itself means to cut or dissect.

Anatomy is the science which presents the detailed physical structure of an animal. It is essentially analytical, altho topographical anatomy concerns us most, being a study of various parts of the body with reference to surgery and medical diagnosis.

The study of anatomy must serve as the basic study in any course of instruction in the care and health of the dog. Without it, pathology, the science of treating of diseases, their nature, causes, progress, manifestations, and so forth would not have a reliable foundation.

Lack of Anatomical Knowledge

Yet great astonishment arises out of the situation that those who breed dogs, perhaps thru many years, do not give attention to the study of anatomy. Breeders have bred champion after champion for the show ring and yet few of them can state clearly the location of the various organs, the bone structure of the dog, or the stages in the journey of food thru the alimentary canal.

Notwithstanding, many breeders and dog owners believe they can treat their dogs in sickness. These same assumed doctors may treat a stomach ailment not knowing whether the stomach is nearer the shoulders or tail of the dog. Eyes may be treated even tho it is not known whether the eye internally is of solid or liquid matter. Request a dog owner to count the pulse of his dog; he is at a loss to know what part of the dog to touch in order to feel the beat of the pulse.

Knowledge of Anatomy Aids Dog Breeder

A study of anatomy, particularly of the bone structure, enables the breeder more easily to label his puppies of good or poor type according to the breed standard. An understanding of gait or movement of the dog is made easy if the observer is familiar with the anatomy of the dog in regard to shoulders and thighs.

On the whole, we cannot think of any subject in canine work which is more basic and yet comparatively less understood than that of anatomy.

The Will to Live

The body of the dog is a wondrous masterpiece put together by Nature. It houses a vitality which is almost unbelievable in its persistence to exist. Dogs suffer intensely over a long period of time without a whimper. They may be mistreated, neglected, underfed, wrongly fed, exposed to the elements, perhaps plied with poisonous medicines, yet they cling to life with a hold which is almost beyond belief.

The desire to live, the determination to

retain the spark of life, is perhaps more intense in the dog than in any other animal, even the human being. Were it otherwise, dogs could not live to any advanced age, their numbers would dwindle, and they could not progress under modern living conditions, separated as most of them are from their natural wild life of the woods and fields.

Thanks to the tremendous natural stamina of the dog's body, many remedies and indeed not a few veterinarians have received credit for saving the dog or keeping it alive when in truth Nature and the vitality which Nature has instilled during the hundreds of centuries

the dog has lived his own life, dependent upon his own resources, should receive the credit.

TEN MAIN DIVISIONS OF ANATOMY

The physical structure or organization of the dog (or man or any other mammal) divides itself into the following ten main groups:

I. Skeletal or bone structure; II. Muscular system or movement; III. Circulatory or blood system; IV. Digestive system; V. Excretory system; VI. Nervous system; VII. Lymphatic system; VIII. Ductless gland system; IX. Reproductive system; X. Sensual system or organs of sense.

I. THE SKELETON OR BONE STRUCTURE

See pages 4, 5, 7, 16 for photographs and sketches of the dog's bone structure.

A reference to the illustrations reveals clearly the shape, proportion, size and relative positions of the various bones of the skeleton.

Construction of Bone

A bone is composed of two kinds of material—outer or compact tissue and inner or cancellated tissue. The cancellated tissue has a spongy appearance, is light and porous, and filled with red marrow.

The outer surface of the bone is covered with a thin membrane called the periosteum. Thru the minute pores of this membrane and thru the very small blood vessels, nourishment passes into the bone.

Bones have a "Give"

The strength and condition of the bones are dependent upon the proper mixture of earthy (mainly calcium and phosphorus) and animal matter. The composition of bones is about thirty parts by weight of the animal matter to seventy of the earthy matter.

Bones are not solid. Internally they are porous, containing cavities of various sizes, canals for blood vessels, and an abundance of flat cells. In fact bone is a dense form of connective tissue, a living thing, not the iron-like substance that of by the popular mind.

The skeleton or bone structure of the dog is perhaps the most important of the ten divisions in the study of anatomy. The skeleton of the dog, not including the teeth, consists of 228 to 232 pieces, varying according to the age, being fewer in the old than in the young as some bones closely related unite in later years.

The skeleton is the sum total of the bone structure consisting of the bones themselves and the framework of cartilage upon which the soft tissues or flesh of the animal are builded.

General Divisions of the Skeleton

There are two general divisions of the skeleton.

1. The axial, which might be termed the up-and-down or vertical division; it embraces the backbone, the ribs, the skull and breast-bone.

2. The appendicular, which includes the bones of the limbs, that is, the arms and legs.

The splanchnic is very minor; it includes bones within the viscera or internal organs, such as in the case of the dog, the cartilage in the penis.

Bones not Stiffly Anchored

The joints or articulations are made possible by ligaments. These fibrous bands determine the freedom of movement according to their thickness, attachment and other qualities.

In this present study we can do little more than to group the various bones of the skeleton and to state the names.

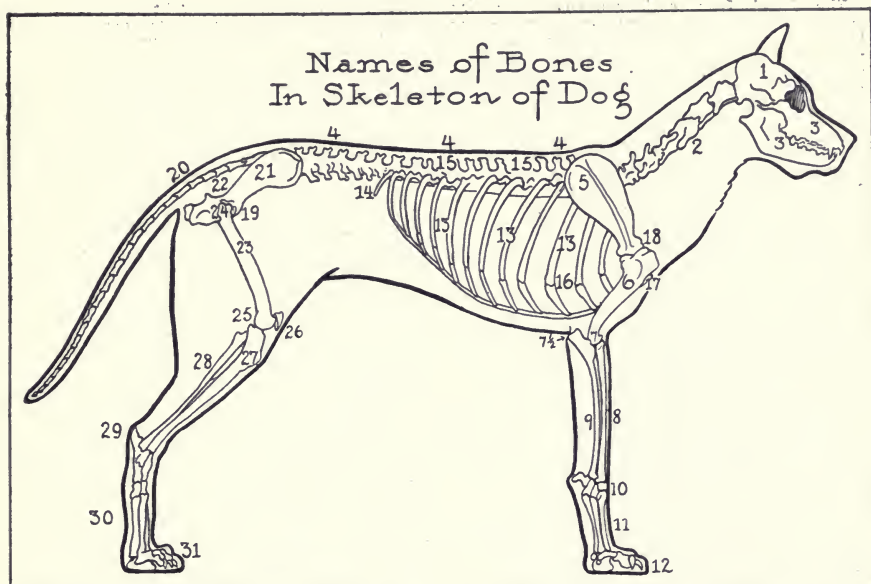
The Parts of the Skull

We begin with the skull, which in dogs shows a wide variety of shapes, sizes, and planes. The skull fits into the first bone of the spinal column by a ball-and-socket joint, and thereby the head has free movement.

The cranium is the cavity which houses the brain.



● Photographs of the bulldog skeleton. Left a side view and excellent as an aid while reading Sec. I. Center, "head on" view of the head. Right, complete front view.



1. Skull. 2. Beginning of spinal column (neck bone), which continues as part of backbone to base of tail (near 21). 3. Jaw bones. 4. Backbone or vertebrae (from base of Skull to end of tail). 5. Scapula or shoulder blade. 6. Humerus. 7. Elbow. ($7\frac{1}{2}$ —elbow prominence.) 8. Radius. 9. Ulna. 10. Pastern joint (carpus). 11. Metacarpal bones. 12. Front digits or toes (phalanges). 13. Ribs. 14. Floating ribs. 15. Vertebrae discs. 16. Thoracic or chest cavity. 17. Sternum or breast bone. 18. Clavical or collarbone. 19. Pelvic structure. 20. Coccygeal or tail bones. 21. Ileum. 22. Sacrum. 23. Femur or thigh bone. 24. Hip joint. 25. Stifle joint. 26. Knee cap or patella. 27. Tibia. 28. Fibula. 29. Hock joint or tarsus (really corresponds to human ankle). 30. Metatarsal bones. 31. Rear digits (toes, phalanges).

NOTES ON SKELETAL FRAMEWORK

There are always 7 joints or portions to the neckbone in mammals—from the mouse up to the largest mammal, the elephant.

There are five main ball-and-socket joints, the rounded end of one bone fitting into the cuplike or concave end of the other—two in the rear: the hip joint (No. 24 in the illustration), stifle joint (25); two in the front: scapula fitting into the humerus, and the humerus at the elbow fitting into the radius and ulna; the skull fits into the first bone of the neck (beginning of spinal column).

The rib structure is intriguing. The top ridge suggests the points of barbed wire. The first and smallest pair of ribs is located at the collar bone, between the scapula-humerus socket. 7 pairs join into the sternum or breastbone, the others run into a group of their own along the base

line except that the 13th or last pair has free ends.

Whereas the scapula or shoulder blade is largely concave, on the side attached to the ribs and backbone, the hip joint turns its concave side outward to connect with the femur or thigh bone; consequently dislocation of the hip joint is rather common.

The occipital ridge begins in the middle of the skull just back of the eyes and continues in a straight line to the rear top edge of the skull casing.

The fibula or rear bone of the pair in the middle section of the rear (termed lower or second thigh) is extremely light and small by comparison; the rear bone of the front middle or ulna is larger in proportion.

Also the two bones of the middle front (sometimes termed lower forearm) are not usually straight, the ulna or rear bone twisting a bit, which twisting often is the cause of a "crooked front" on a dog.

The facial framework comprises the eye sockets, nose and jawbones, which carry the teeth. Behind these and forming the peak of the forehead are the parietal bones, with the occipital crest running thru the outer middle backward toward the base of the skull in raised line, more noticeable in some breeds than in others.

The upper jaw (non-movable) is formed by the bone containing the upper teeth and the lower jaw or lower mandible by the bone containing the lower teeth.

The Backbone of the Dog

We next consider the vertebral column or the backbone, which includes the neck. This extends from the base of the skull to the tip of the tail and is composed of individual vertebrae. They are divided into groups according to their position or region.

Each group contains a definite or standard number regardless of the species of animal life, whether dog, man, goat, horse or what.

20 to 22 Bones in Tail

In the dog we have the following groups of vertebrae: 7 cervical or neckbones; 13 dorsal or thoracic (above the lung cavity); 7 lumbar, above the abdominal cavity; 3 sacral or pelvic, above the pelvic cavity; 20-22 coccygeal, constituting the bony part of the tail.

The vertebrae or sections of backbone are joined together by fibro-cartilaginous discs and these form a central canal, in which the spinal cord is carried.

The Ribs of the Dog

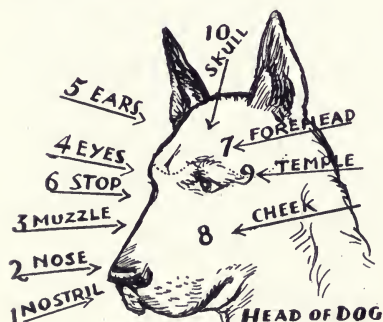
The ribs and the sternum are the other two portions of the axial skeleton. The rib structure is often termed the thoracic skeleton, the thorax being the chest cavity which contains the important organs heart and lungs.

The sternum is the breastbone or front projection of the central line formed by the lower ends of the ribs thru the costal cartilages.

The dog possesses 13 pairs of ribs or 26 ribs. Nine of these are sternal, being attached to the sternum or breastbone; four asternal. The last pair of ribs are floating ribs being unattached at the breastbone.

The Pelvis

The pelvic skeleton is a bony circular cage inclosing in the male the bladder, rectum and prostate gland and in the female the uterus (womb), bladder and rectum. See sketches of sexual organs, page 14.



It is attached on the top to the sacrum and consists of three bones, which when united as in the adult animal are known as the innominate bone.

Causes of Caesareans

The size of the pelvic cavity is of much concern to the breeder, particularly of a breed which has a large head as the puppy may not pass thru the opening, particularly in an older dog, whose bones have lost the "give" of early days.

The Legs of the Dog

We come now to the appendicular skeleton, which consists of the bones of the forelegs and hindlegs.

We begin with the scapula, a large, flat, triangular bone attached to the upper side of the chest wall and the backbone by muscles. The scapula or shoulder blade is extremely important in judging a dog's gait for its angle of direction and the firmness of attachment determine the movement in great measure.

The general shape of the blade may be represented as that of a pear with a tapering side downward and at this down end a ball-and-socket joint connecting with the humerus, the bone which in turn connects the shoulder blade with the elbow.

Hazy Ideas about Shoulder

There is a hazy understanding of phrases concerning the shoulder blade. Ofttimes a breeder refers to a dog as possessed of long, sloping shoulders.

The shoulder blade is flat and yet its outer surface, which one may feel with the hand, is divided into two by a raised line running down the center.

There is a small irregular plate embedded in front of the oval ball-and-socket joint, which is known as the clavicle or collar bone. It is "one of its own," not moving with the rest of the skeleton.

The shoulder blade is attached at its tapering or bottom end by the ball-and-socket joint and underneath by muscles against the outer wall of the chest. Every freedom of movement is thus permitted.

Not Much Slope

Just what is meant by sloping shoulders, a common phrase, is difficult to determine. The top of the shoulder blade, that is, the outer edge of the large end of the pear shape does not quite reach the top line of the backbone. The shoulder blade is in front and at the top of the chest and the angle at which it runs backward is slight, perhaps in the average dog not more than 35 degrees out of line with perpendicular.

The space between the tops of the two shoulder blades is the withers.

The Front Running Gear

We come now to the front running gear of the dog, comparable to the arms of the human.

Humerus, Radius, Ulna

The humerus, already mentioned, is a long, stocky bone with a slight twist, and extending downward and at the lower end backward from the shoulder to the elbow. At times it is referred to as the upper forearm.

It has a pulley-like joint at the bottom and this runs into the two bones of the lower forearm, namely the radius and ulna, long thin bones which are separated from each other by very narrow space. They articulate or move

7—ANATOMY OF THE DOG

with each other slightly. As the dog becomes older, the radius and ulna may ossify into each other.

The prominence which we know commonly as the elbow is the top of the ulna altho the elbow proper includes also the pulley-like joint thru which the humerus joins the radius.

The Pastern of the Dog

The radius and ulna run into the carpus or pastern, which in turn is composed of seven or eight bones in two rows, one above the other.

Bones of Front Foot

The metacarpal bones, five in number, move with the bones of the carpus at the top and with the bones of the toes at the bottom.

The bones of the toes are known as digits, five of them, each composed of three phalanges, except that the first or inside usually has only two and compares to the human thumb.

The Rear Running Gear

We come now to hindquarters of the dog, comparable to legs of the human. The hipbone or pelvic limb begins at the backbone with the ileum and is shaped somewhat like the shoulder blade, sloping however towards the front at about a 45 degree angle.

The other two bones of the hip are the ischeum and the pubis. These are fused together in the adult animal to form the pelvic structure previously mentioned.

Formation of Rump

The ileum articulates with the sacrum; above the level of the latter, the ileum forms a prominence known as the angle of the croup or rump.

What is the Stifle Joint?

Below the hip joint is the thigh bone or femur, which corresponds to the humerus of the front. It is a long stout bone extending downward and frontward from the hip joint above to the stifle joint below. It corresponds in the human to the bone from the hip joint to the knee, supporting the thigh.

When we speak of the hip joint being dislocated in a dog, we mean that the femur has gotten out of the socket of the hip bone or pelvic combination, an easy happening due to the shallowness of the socket.

Knee Cap Slips Easily

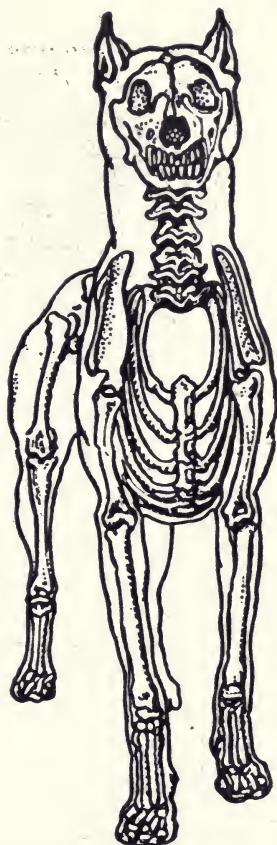
Where the femur joins the lower bones, tibia and fibula or leg bones, is the knee cap of the human or the stifle joint of the dog. This joint (patella) is long and narrow and held loosely in place by a single ligament. It also fits into a groove in the femur. If these grooves are not well developed, the knee cap may slip, a condition that is found often in smaller breeds.

Hockjoint and Hind Feet

The tibia is a bone about the same length as the femur or thigh bone; it extends downward and backwards from the stifle joint to the hockjoint or tarsus.

The fibula is a slender bone running almost parallel to the tibia; it is in the rear and is not nearly so large or curved as is the tibia.

The tarsus is the hockjoint of the dog. It



● Artist's sketch of canine skeleton viewed from front (that of doberman pinscher)

consists of seven bones and corresponds to the human ankle.

Hockjoint but no Hock

The bone connecting the hockjoint with the toes is the metatarsus and is not the hock as some term it (there is no hock—there is only the hockjoint). It consists of five bones running upright and corresponds with the metacarpal of the front leg.

The digits or the toes of the rear foot are composed of phalanges and correspond in every way with the bones of the front foot. The dog has 5 toes and four toenails on each foot, the thumb and big toe not having nails. Occasional dew claws, on any of the legs are not considered toenails. Most dogs also have a remnant of a sixth toe also, located above the foot.

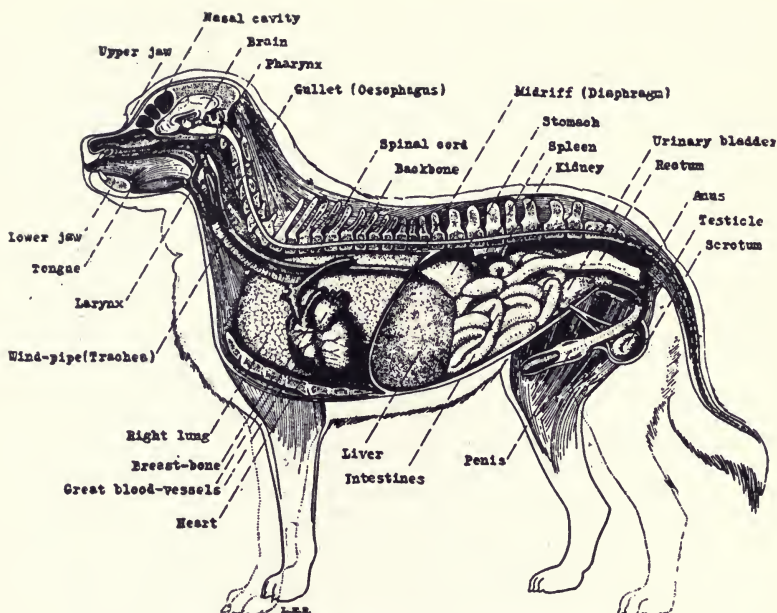
II. THE MUSCULAR SYSTEM OR MOVEMENT

The muscles are fleshy or meaty, and are elastic bands; the elasticity produces motion thru contracting and expanding.

Voluntary and Involuntary Muscles

Muscles are always attached either to a bone

or to an organ. If the muscles are moved, that is, either contracted or expanded at will, by a message from the brain thru the medium of the nerve, the muscle is termed voluntary. Other muscles particularly those found in



GENERAL ANATOMICAL SKETCH OF THE DOG

the intestines are not under control of the brain; they move without any consciousness on the part of the brain; they are termed involuntary.

The shapes of the muscles vary greatly according to use or location in the body. They may be long or short, broad or narrow, circular or of other shapes.

Two Ends of Muscle

A muscle is made up of two parts—the red fleshy portion and a white tendinous portion; the latter may be round or flat. The muscle is attached at one end known as the origin while the other end, not fixed, is termed the insertion and is the movable part of the muscle.

Protective Covering for Muscle

The loose fibrous tissue called fascia lies between the muscles themselves and between the muscles and the skin. Also the synovial sheath covers the tendon and contains a lubricating fluid to assist movement.

It is not feasible in this broad, elementary discussion of anatomy to list the various muscles (approximately 660, forming about two-fifths of the body weight).

III. THE CIRCULATORY OR BLOOD SYSTEM

The circulatory or blood system of the dog is a network of vessels running thruout the body; into these vessels or tubes the heart pumps the blood in regularly measured pulsations.

This system might be called also the blood vascular system. It comprises four parts—heart, arteries, capillaries, veins.

Muscles the Basis of Strength

The muscles are the controlling factor in the gait and movement of the dog and furnish the resistance of the dog to any counter movement. In general they produce the strength, vitality and ability of the dog to take care of himself.

We can "Feel" Muscles

The muscles lie very close beneath the skin and consequently can be massaged by external application.

"Come-and-Go" Action

It is to be noticed that muscles appear always in pairs, that is, one part must act in opposition to the other. When one part contracts, the other must relax. When the muscle in the front of the arm contracts, that on the back must relax.

Muscles and External Beauty

The well-muscled, firm-muscled dog contrasts to the dog with flabby muscle and soft, sagging flesh. The muscles more clearly reveal the outlines of the body, showing more readily the surface contour. The relative position of one part of the body to another is made more evident by the muscles.

Listening to the Heart

The sound of the heart is one of valves opening and closing. The contraction of the heart is named systole, the reverse action diastole.

There are two sounds—one as the blood is driven into the arteries; the valves close and

9—ANATOMY OF THE DOG

produce the first sound; this is dull and prolonged as heard thru the chest wall.

The other sound is short and sharp, produced by the closing of the valve between the ventricle (lower part of the heart) and the outgoing artery.

If these valves do not work properly, that is, if the blood does not proceed in the right direction rapidly, there is a gushing noise or murmur.

The Pulse

The blood with its vivid red color is held the sign of vigorous life. We speak of having the blood of certain ancestors in our veins; it should be stated, in our arteries, for life is in the arteries and death in the veins.

There is however, no heredity, no passing on of characteristics in the blood itself; that is done entirely in the reproductive organs. We never possess any of the actual blood of our ancestors.

Carry Nutriments and Waste

The two functions of the blood are first, to carry the nutritive material from the digestive system to other parts of the body; and to carry oxygen from the lungs to the building tissues. Second, to carry the waste products of the digestive system and other parts of the body to the excretory system and to carry the carbonic acid gas to the lungs from the tissues.

Thus there is constant movement, constant change, constant tearing down and building up by the circulatory system.

Heart is a Muscle Pump

The heart is, after the brain, the most vital organ of the dog or of any mammal. It is essentially a muscle, being hollow and inclosed in a sac or membrane called pericardium, a very tough membrane.

The expansion and contraction of the heart as a muscle, in rhythm or measured time, pumps the blood thruout the body.

"Go-and-Return" System

There are really two circuits maintained at the same time by the heart—the driving of the blood into the arteries and capillaries at each contraction, and the return of the blood thru the veins into the auricles. A system of valves as in any pump prevents backflow.

Heart a Symbol of Life and Love

In all ages and among all peoples the heart has been regarded as the very essence of life. To take the heart out of a person, to get to the heart of things, to say that one has lost heart, that one has eaten a hearty meal, that one is a hearty person, that one is of good heart—all these express the age-old veneration in which this organ of the body has been held.

Life goes out with the stopping of the beating of the heart. As long as it beats, there is no death. Day after day, month after month, year after year, from the moment of birth, without missing a second, whether we work or play, whether we are awake or sleeping, this never-ending engine keeps on pumping until the very last instant: if it

rests for just an instant too long, life flees never to come back.

Feeling Beat of Heart

The heart in location is the first vital organ in the body altho the lungs encircle it. It is placed in the chest and well forward in the body. Its movement can be felt best about at the middle of the ribs on the left front side of the chest.

The arteries are always full. Each heart beat as the heart expands can be felt because of the pushing of the blood into the arteries. This wave constitutes the pulse.

The veins have thin walls and do not carry a pumping stream; they have no pulse.

The pulse varies greatly with the breed, age and size of the dog; it may range from 70 to 120 waves per minute. It is higher in young animals, small breeds and nervous sensitive breeds. A good average for the adult dog of medium-sized breed and in good health is a count of 90 per minute.

Where to Count Dog's Pulse

The best place to feel this wave of the flow of blood, the pulse, is to place the finger upon the femoral artery, on the inside of the thigh of the dog (femur bone), well up above the stifle joint and almost where the thigh is on a level with the belly line.

Names of Main Arteries

The arteries are thick tubes of elastic structure. When this elasticity is lost, there is hardening of the arteries and high blood pressure.

The pulmonary artery from the right ventricle supplies the lungs only. The common aorta carries the supply of blood to various parts of the body. The cephalic artery is responsible for the supply of blood to the head.

Blood, Essential of Living Tissue

Blood is regarded as the essential element of flesh or living tissue. From the tissues it is carried back thru the veins to the heart to be repumped, and so on without end until the end.

Capillaries Connect Arteries, Veins

The connection between the incoming artery and the outgoing vein is a system of very minute vessels or tubes called capillaries, a network of millions of conduits.

Fatality in Jugular Vein

The vein which drains the blood back from the head and neck to the lungs is the jugular vein, corresponding to the carotid artery. To sever this vein in the neck (it is near the surface) brings on death instantly.

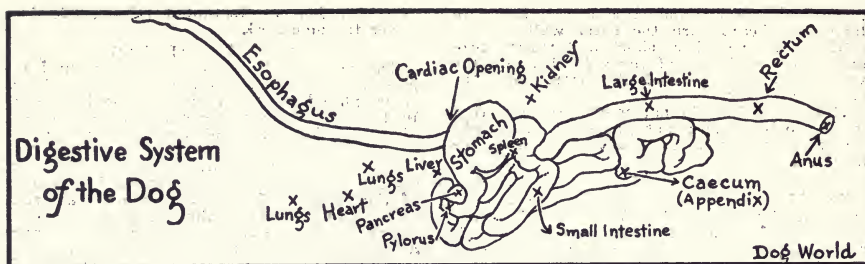
Liver as Blood Filter

The blood from the spleen, stomach and intestines is carried back to the heart thru one large vessel called the portal vein. It first leads directly to the liver; there the blood seeps into the capillaries and these unite in the hepatic vein, from which the blood returns thru the vena cava into the heart to be purified and re-pumped. Thus it is evident that the liver has a highly important function, that of straining impurities out of the blood in the digestive process.

IV. THE DIGESTIVE SYSTEM

The digestive system is concerned with taking in, preparing and disposing of food

for the body. Chemical and mechanical changes must take place before the food which is



taken into the mouth becomes a part of the living tissues of the body. This process is known as digestion; and the transfer of the digested food into energy and tissue is known as assimilation.

The route of the digestive system is the alimentary tract; it may be said to extend from opening to opening, from the mouth to the anus or the rectum.

It is divided into—1. mouth, 2. esophagus, 3. stomach, 4. small intestine, 5. large intestine. Along with these we must consider the digestive glands, the liver, spleen and pancreas.

Saw-Toothed Lower Lip

The start of the journey is at the opening gate, the mouth, which cuts, grinds and breaks up the food for digestion. In the dog the lips being thin and mobile, do not play an important part in the seizing of food as is true with herbivorous animals such as the horse and cow.

It is interesting to note that the upper lip has a central groove while the edges of the flaccid lower lip are highly dented or saw-toothed in outline.

Dogs "Throw" a Drink

Water is taken into the mouth by lapping, a throwing-back of the tip of the tongue toward the roof of the mouth.

Gulping Not a Vice

The dog chews very little at all except when crushing bones and eating hard food such as dry biscuit. Gulping is the customary, natural act of the dog.

As saliva is not a particularly important juice in the digestion of the food in a dog, as it is in the human, it is not necessary that the dog chew food thoroly. The shape of the teeth indicates that their function is to tear rather than to grind.

The muscles of the teeth and jaws are strong because the dog does with his jaws most of the things we do with our hands.

The salivary glands secrete and pour saliva into the mouth for the purpose of softening the food. These glands are named parotid, submaxillary, sublingual, and orbital.

A Superstition about Dogs

The tongue is thin, long and mobile. The size and shape vary with the breed. The upper surface is marked by a central groove and is coated thickly with short, thin hair or papillae, of rough touch to the human skin. The under surface has a cord composed of muscular tissue. It was presumed in old times and by some today that to remove the "worms" or cord from the tongue cured many ills, including running fits.

Easy to Breathe and Vomit

The soft palate, which hangs from the roof of the mouth between the back of the mouth and the pharynx, is short in the dog; hence the dog can breathe easily thru the mouth and can vomit easily.

Teeth a "System" of Own

The teeth can be considered under the separate heading dentition, but as they are a practical part of the digestive system, we discuss them here. See illustration on page 16.

The teeth are the hardest organs of the body, deeply imbedded in the jaw bones.

The first or milk or baby teeth, begin to erupt as early as three weeks. All milk teeth are completely broken out of the gums by the age of five weeks.

The change to permanent teeth begins at four months and is ended at seven. The molars are permanent teeth which begin at four months and end at seven months for their final appearance.

The dog, whatever the breed or size, with few exceptions, has 42 permanent teeth, 22 in the lower jaw and 20 in the upper.

Teeth are named according to the size, shape or purpose—twelve incisor or cutting teeth, four canine teeth (or fangs, two in each jaw, one on each corner and the upper ones fitting outside the lower ones—and strangely there are always the six incisor teeth between the two canine teeth), eighteen pre-molars, and eight molars or grinders.

The varying sizes and shapes of the dog's teeth contrast with the greater uniformity of the human teeth.

In composition, the tooth has three different structures—the enamel, the thin external white part, covering the crown only; the ivory or denture under the enamel; and the center, containing the nerve and small blood vessels.

Pharynx is "Storm Vestibule"

The pharynx is a vestibule or cavity behind the mouth and at top of the neck. It is attached to the base of the cranium above while below is the larynx. It serves as passageway both for air and food. Bones can easily become lodged here.

The Esophagus has "Waves"

The esophagus or gullet is on the outside of the neck, that is, above the trachea, or windpipe; when we rub the front of the neck, we contact the gullet. About midway, it turns behind the windpipe.

It passes along the neck thru the chest (above the heart), thru the diaphragm and then quickly enters the stomach.

11—ANATOMY OF THE DOG

As the dog swallows, the esophagus has a wave-like movement toward the stomach. In vomiting, the movement takes place in the opposite direction.

"Rubber" Stomach

We come now to the central and most important member of the digestive system, the stomach. It is large compared to other internal organs and yet small in consideration of the work it performs.

The stomach might seemingly be made of rubber as it can stretch considerably, even to the extent of holding fully three quarts in a dog of 40 pounds weight. But this very elasticity deludes both humans and dogs into believing they can load the stomach with any excess amount of food.

The dog has a sensitive stomach; he nauseates quickly and vomits readily.

Liver and Stomach Neighbors

The stomach has the shape of a curved sack and lies immediately behind the diaphragm and liver, which is somewhat to the left side.

Inside Wall of Stomach is Rough

The lining of the stomach is studded with glands; its surface is rough and corded. An inflamed condition of this lining brings on gastritis.

The glands secrete pepsine and acid; and the two together constitute the gastric juice, which breaks down the proteid constituents of food into more soluble peptones.

Many Twinings and Churnings

The stomach turns and revolves upon itself until the food is in a semi-fluid form called chyme. Then it passes thru the pylorus into the small intestine.

Spleen Attached to Stomach

The spleen is found on the outside left of the stomach.

On the right side are located the right lobe of the liver and the intestines. The exit to the stomach is the pylorus.

Three Sections of Small Intestine

The small intestine has an average length of about thirteen feet (about five times the length of the body) and is divided into three parts—duodenum, jejunum and ileum.

The intestines hang from the backbone supported by a thin transparent membrane filled with many small blood vessels.

Necessity for "Healthful" Intestine

The intestines themselves are lined with mucous and other secretory glands. The inflammation of the membrane and glands causes many ills of the dog such as diarrhea and intestinal catarrh. Most parasites are harbored in the small intestine of the dog.

Three Sections Large Intestine

The large intestine, much shorter than the small intestine, is about two feet in length and is composed of caecum, colon and rectum.

No Peristaltic or Wave Motion

Whereas the small intestine has both longitudinal and crosswise bands of construction in order to give the wavelike contraction, there is no such construction in the large intestine.

The Dog's Appendix

The caecum is about three to five inches long and is found in the region of the right flank. It is twisted in the form of a spiral and corresponds to the appendix in the human. It opens from the small intestine thru the ileocaecal valve. Here the whip worm

and other parasites often lodge, beyond direct contact with most medicines.

The Winding Colon

The second part of the large intestine, which also is called the bowel, is the colon; this is attached to the backbone just back of the kidneys. It winds about, touching the stomach on the right, then backward to the left kidney.

End of Alimentary Canal

The third part of the large intestine is the rectum; this ends with the anus or external opening thru which the contents of the bowel are discharged. It is several inches in length.

Infection of Anal Glands

Where the rectum reaches the anus, the anal glands are located. Each one of these is a sac about the size of a pea and often times filled with dirty gray fatty substance of unpleasant odor. These often become inflamed, swell shut and cause a swelling so that defecation or emptying of the bowel is difficult or impossible. The dog may slide on its haunches. These glands should be squeezed about every three months. Constant constipation tends also to cause the condition.

Liver is Largest Organ

The liver is the largest organ of the body, solid and weighing about 5% of the weight of the body. It is divided into six or seven lobes by fissures and fastened to the diaphragm, the separating membrane between the chest above and the abdomen below. It is also attached to the stomach and abdominal walls by ligaments.

The second chief purpose (filtering or straining the blood being the other) is to secrete bile and sugar.

Origin and Uses of Bile

The bile in turn is poured into the gall bladder, which is enveloped within the folds of liver. The bile is emptied from it into the duodenum or the first part of the small intestine during the process of digestion and for the purpose of emulsifying fat (rendering it liquid). The bile also serves as an antiseptic to oppose putrefaction (decay) of semi-digested food. It is indeed an important factor in digestive health.

The sugar that the liver furnishes is also very necessary in the blood; improper functioning causes diabetes.

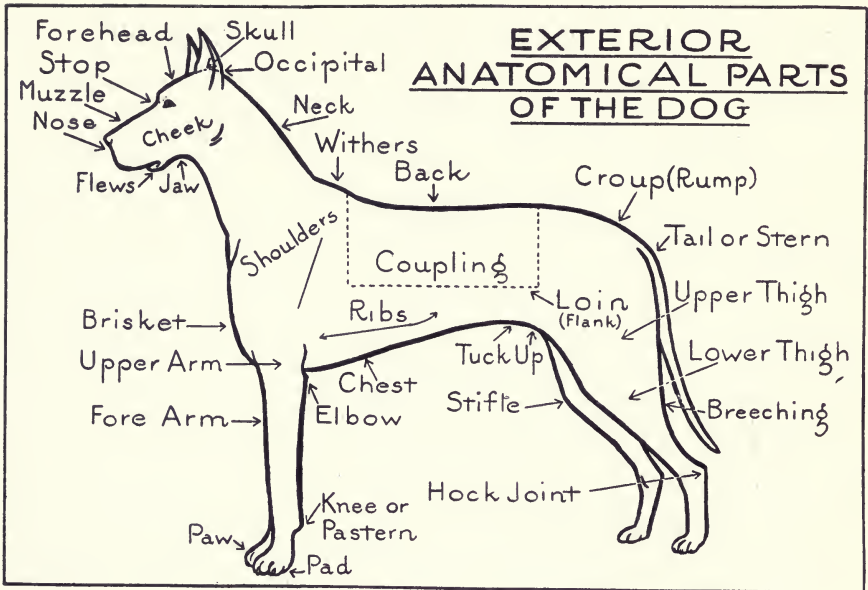
The liver has a large supply of blood; if it is ruptured in an accident, internal bleeding ensues and usually is fatal.

The "Sweet Breads"

The pancreas (sweet breads) is a V-shaped organ gland of two long narrow branches; these meet in a sharp angle just above the exit or pylorus of the stomach. One duct unites with the bile duct and the other enters the intestine at the duodenum just a little further back.

Importance of 3 Pancreatic Juices

The pancreatic juices are the most important in the digestive process, even more important than the gastric juice. The pancreatic juices contain three ferments—amyllopsin, trypsin and lipase. The first converts starch into sugar; the second converts proteids into soluble peptones but in a different and further way than does the gastric juice; the



third (lipase) further emulsifies and saponifies fats and splits them into fatty acids and the like.

The small intestine also secretes juices which help considerably in digestion.

Prevalence of Bacteria in Bowel

In the large intestine there are only macera-

tion and decomposition, in which bacteria play an important part.

The waste products pass on to the rectum and leave the body thru the anus at intervals, at least twice daily in the normal adult dog.

V. THE EXCRETORY SYSTEM

We do not speak here of the expulsion of waste products out of the large intestine but of waste and impure products which are eliminated from the body by means of the excretory organs, which are lungs, kidneys and skin.

Waste and Poison Removers

The lungs exhale carbonic acid gas and watery vapors.

The kidneys excrete the waste of nitrogen such as urea and soluble salts.

Dog's Skin Sweats Little

The skin eliminates water but not to any extent in the dog. This decided difference between the dog and the human is the basic cause of much of the skin disease in the dog.

Hair and Nails are Skin

The skin of the dog is mostly a protective organ. It has two layers—the epidermis or outer, and the dermis.

The hair and nails are formed from modified cells of the outer layer.

Inner Skin is Complex

The inner layer or dermis is a connecting tissue containing glands, blood, lymph vessels and nerves of the skin. There are two kinds of glands in the dermis, namely sebaceous,

which secrete an oily substance which in turn lubricates the hair and gives it sheen and liveliness; and the sweat glands, which are plentiful on the pads of the dog, but perspiration from the surface of the dog's body is practically nothing at all.

Kidneys as Strainers

The kidneys are two bean-shaped organs, one to the right and the other to the left of the backbone and lying at the roof of the abdomen.

The kidneys are tubular glands consisting of many tubules, each of which commences at the cortex and ends in the pelvis. There is a network of capillary blood vessels around each tubule; thru the walls of these the waste products escape from the blood stream into the kidney.

Kidney Originates Urine

As the urine collects in the pelvis or the lower part of the kidney, it finds its way thru the ureter into the bladder.

Bladder is Reservoir

The bladder is a storage tank for urine, expelling it into the urethra when the sac is full, by contraction of the muscular wall. The

13—ANATOMY OF THE DOG

walls of the bladder are light and transparent, able to expand greatly and to hold a large quantity of urine.

"Stones" Grow from Within

Stones may form in the kidneys and bladder

thru certain secretions, usually alkaline; these stones may grow to an enormous size. Occasionally they disintegrate but in most cases must be removed by operation.

VI. THE NERVOUS SYSTEM

The "big chief" of the nervous system is, of course, the brain, which functions thru the medium of the nerves. The heart may supply the life blood but the brain alone can supervise the movements and functions of the body and all its parts.

Two Groups of Nerves

There are two parts of the nervous system—central, which is made up of the brain and spinal cord; and the peripheral system, which includes the nerves of the head and spine, and the sympathetic nervous system.

2 Functional Divisions of Nerves

The nerves themselves divide into two classes—the sensory or afferent nerves, which carry impulses from the tissues to the brain. All feeling, all awareness is recorded in the brain in reality and not in the part of the body which furnishes the sensation. The sensory nerve carries the impulses from the affected part to the brain.

The "Boss" Nerves

The second class of nerves are the motor or efferent, which carry impulses from the brain to the tissues, directing them what action to perform.

Two Parts of the Brain

The brain is a mass of nerve substance occupying the cavity of the skull. The cerebrum is the larger and more important part and is divided into two by a central deep fissure.

The cerebellum is located behind the cerebrum or brain proper. It has the appearance of an English walnut, having many folds and fissures. It is concerned mostly with the control of equilibrium. When a dog staggers or walks unsteadily, the cerebellum likely is affected.

"Central" for Nerve Wires

The spinal cord is a long mass of nerve substance inside the backbone, running from the head to the sacrum (rear base of tail). All the nerves of the body run off from the spinal cord with the exception of twelve, which originate in the brain itself.

The peripheral nerves divide and subdivide from the brain and the spinal cord so as to communicate with all the body tissues.

Nerves and Heart Affect Each Other

The sympathetic nerve system regulates the supply of blood to the internal organs in that it controls the contraction of the blood vessels.

VII. THE LYMPHATIC SYSTEM

The lymphatic system is also known as the absorbent system. In addition to the blood there is another fluid called lymph, and it circulates thruout the entire body and all the spaces of the tissues by means of its own complete channels.

Protector Against Body Poisons

It assists in the absorption of the food material, carries off excess material and absorbs certain poisonous and waste products of these.

Complete System of Its Own

The lymph drains out of the tissues thru vessels similar to blood vessels. It is discharged into the thoracic duct and from there into the vein anterior vena cava, which in turn discharges into the right heart auricle. Thus the heart pumps both blood and lymph.

As the lymph absorbs toxic material, the nearest lymphatic glands swell and become inflamed when infective material gains access to the circulation thru a septic wound.

VIII. THE DUCTLESS GLAND SYSTEM

The ductless glands are the spleen, thyroid, thymus, adrenals and pituitary bodies. They secrete without any definite channels thru which the secretions are conveyed away.

The Spleen a Mystery Gland

The spleen is shaped like a sickle and is attached to the stomach. Its exact function is not clearly known altho it does break down certain elements in the blood system.

Goiter and Thyroid

The thyroid is situated on the windpipe close to the larynx and consists of two lobes, one on each side of the center line. Several smaller bodies connected with the thyroid are named parathyroids.

The thyroid produces a secretion which is essential to the body, likely one which neutralizes poisons. Goiter is a swollen diseased condition of the thyroid gland.

Another Mystery Gland

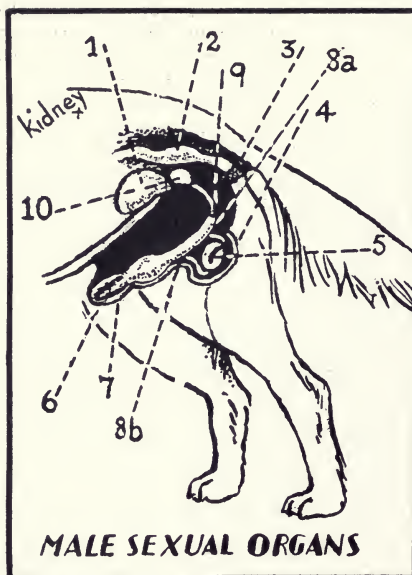
The thymus is situated on the floor of the thorax (chest) in front of the heart. The exact nature and function of this gland are not known but when a young animal is castrated, the gland does not atrophy and disappear promptly as is the case when there is normal reproductive activity.

Stopping Internal Bleeding

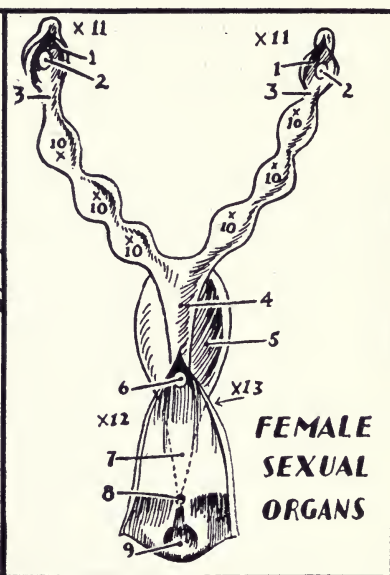
The adrenals are two small oval bodies attached to the kidneys. An extract from these constricts small blood vessels and arrests bleeding.

Pituitary Near Brain

The pituitary is a small structure on the floor of the cranium beneath the brain. Deficiency brings on fatness and "foolish actions."



MALE SEXUAL ORGANS



**FEMALE
SEXUAL
ORGANS**

LEFT, MALE SEXUAL ORGANS. 1. Bladder. 2. The rectum portion of the colon or large intestine leading on to the external opening or anus at 3. 4. Scrotum or bag containing the testicles (5).

6. Penis. 7. Sheath or covering of penis. 8a and 8b. Vas deferens — tubes from the prostate gland to each testicle (and carrying semen into the urethra).

9. Urethra duct, carrying urine from bladder to external exit (penis, male; vagina, female). In male, urethra is also a genital duct for semen. Do not confuse urethra with ureters, of which there are two, one leading from each kidney to the bladder. 10. Prostate gland.

RIGHT, FEMALE SEXUAL ORGANS— 1. and 11. Ovarian bursa or sacs. 2. Ovaries (one on each side). 3. Horns or Fallopian tubes (one on each side) of uterus (womb).

4. Main body of uterus or womb. 5. Bladder. 6. Os uteri (mouth of womb), from which puppies emerge.

7. Vagina (external opening). 8. External urethral orifice (where urine emerges). 9. Fossa clitoridis. 10. Feti (puppies) in the womb.

11. Region of kidneys. 12. Rectal opening (above vaginal opening). 13. Vulva attached to pelvic bone.

IX. REPRODUCTIVE SYSTEM

The reproductive system in the male consists of two testicles, the excretory duct or vas deferens, and the penis, which contains the urethra.

The two testicles in the male are inclosed in a sac, the scrotum. Each testicle hangs in the bag or scrotum by a spermatic cord which consists of the vas deferens, an artery and a vein.

Cryptorchid

Testicles in the fetus or unborn male are not located in the bag but in the abdomen; later (about the age of 3 months), they descend thru the inguinal canal, an opening thru the abdominal wall, into the bag. In rare instances one or both may fail to descend; in this instance the animal is known as a cryptorchid. A testicle remaining in the abdomen atrophies by the age of eight months and is ineffective.

An animal with one descended testicle, however, can be fully effective sexually. An operation can drop a testicle altho on account of the mesh of blood vessels, nerves and tissue, it often is not successful. Injection of atritin may hasten the dropping.

The vas deferens is a small tube which carries the semen or male reproductive fluid from the testicle into the urethra, the canal thru which the semen is carried outside the body.

Cause of Tie

The penis is the male organ of copulation. It consists of tissues that become erect upon an inflow of blood, which, due to depression of the veins, cannot leave promptly. The continued swelling within the vagina of the female holds the penis there until the semen is poured into the vagina. It also, being extreme in the dog, causes the tie or inability of the male to withdraw the penis promptly.

The bone inside the penis is known as the os penis.

The Womb and Vagina

The womb or uterus is the cavity where the feti or puppies develop. It consists of a short body and two long narrow horns, which horns connect with the fallopian tubes.

The opening of the uterus is into the vagina and is known as the os uteri, the mouth of the womb.

The lower part of the external opening of the vagina is called the vulva. Just within the vulva is a small prominence known as the clitoris.

A full description of the sexual organs of both sexes of the dog, their functions and activities, is given in the author's Principles of Dog Breeding, now in its third edition.

When quiescent, the penis is inclosed at its end in a folded skin called the prepuce or sheath.

Sexual Organs of the Female

In the female the reproductive organs are

X. SENSUAL SYSTEM OR ORGANS OF SENSE

The organs of sense, of course, are the organs of the five common senses. We shall describe them briefly.

Eye has Free Movement

The eye is in the shape of a globe and is lodged in the orbital cavity of the skull. It moves in various directions with the aid of muscles and is connected to the brain by means of the optic nerve.

Breed standards call for various shapes of eyes—round, oval, prominent, small, large, almond. These shapes refer to the visible portion as in reality the eye always is of the same round or ball shape.

No Lower Lashes

The eyelids upper and lower protect it in front. There is a third eye lid or haw, membrane nictitans, in the inside corner. A cold may inflame and enlarge is considerably.

The dog does not have any lashes on the lower eyelid.

The lachrymal gland facilitates the movement of the eyelids and also secretes a fluid to wash away foreign bodies.

Construction of the Eye Globe

The globe itself, or eye proper, the eye ball, has a content of semi-fluid inclosed by three coats.

The outer skin of the outer coat is the cornea, transparent and very tough.

The middle of the three coats is a vascular membrane, usually of black pigment. A part of this projects forward into the interior of the eye as the iris.

Iris Determines Color of Eye

The iris is a muscular curtain which contracts or expands under the influence of light and so acts as a lens. Its center is the pupil. The iris determines the color of the eye.

Eye Acts like a Camera

The crystalline lens is just behind the pupil of the eye. It serves the purpose of focusing the rays of light upon the retina. If the light cannot pass thru the lens, this opaque condition is one of cataract.

Inner Contents of Eye Fluidlike

Between the cornea and the lens is the clear watery fluid, the aqueous humour. Back of this is the jelly-like material known as vitreous humour.

The very back of the eye is the retina, a sheet of nerve tissue.

the two ovaries, two fallopian tubes and the uterus or womb.

The ovaries are two small oval bodies, each one situated close to a kidney and each one in a pouch known as peritoneal, namely the bursa ovarii.

In the ovaries are graafian particles, bladder-like, which when fully developed are filled with fluid and ova or eggs. These when ripe burst away from the ovaries and go down thru the fallopian tubes toward the opening of the womb, this however only during the semi-annual heat or season period.

Connect Ovaries and Womb

The fallopian tubes, one on each side, forming a rough U, extend from the ovaries to the corresponding horn of the uterus, opening thru a very small hole. Cutting this channel does not eliminate heat but makes pregnancy impossible.

Three Sections in Ear

The ear, of course, is the organ for hearing. The auditory nerve carries the sound impressions from ear to brain.

The three parts of the ear are external, middle and internal.

Dog's Ear Very Expressive

The external is a trumpet-shaped piece of cartilage covered by skin; it varies in size and shape in the various breeds. It may be carried vertical or downward or in various other postures. It can be shaped voluntarily in such way toward the source of sound in order that the impulses may better be contacted by the dog.

Breathing thru the Ears

The middle ear known as tympanum is a small cavity, protected against the outer ear by the tympanic membrane or drum. From this drum runs the Eustachian tube, thru which air is admitted in order to equalize the pressure on each side of the drum. Thus one can hold his nose shut, blow into his nose, and force the air out thru the ears, often an action of relief when one ascends in an aeroplane or moves up the side of a mountain.

Here also is the balancing mechanism for the body. If injured, it causes staggering and falling.

Ear "Wired" for Sound

Three small bones are found within the middle ear; they connect with the internal ear, a complex structure, which contains a lymph-like fluid in which small bony bodies float. When a sound wave is received into the external ear, the drum vibrates in the middle ear and from it the vibrations are transmitted to the fluid of the internal ear, thence to the brain thru the fibers of the auditory nerve.

It is easy to pierce or damage the ear drum. Consequently probing into the ear should be done carefully.

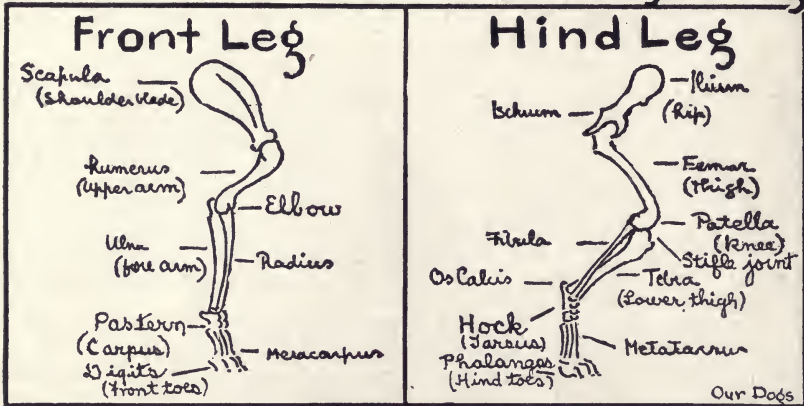
Several Tasters

The tongue is the organ of sense, but not alone for to it must be added the mucous membrane or inner lining of the mouth. Both contain taste buds or cellular organs which convey the sense of taste to the brain thru the fifth and ninth cranial nerves.

The Nose is Much of the Dog

The olfactory nerves are the nerves of smell, distributed generously over the lining of the posterior or rear part of the nasal cavity.

Bone Structure of Dog's Leg



The sense of smell is most acutely developed of all senses in the dog, and at least 800% more sensitive and efficient than the human olfactory nerves.

Dogs not Particularly "Touchy"

There is the final sense of touch, which, of course, originates in all parts of the body and is transmitted by the nerves to the brain. It is not particularly sensitive in the dog, clearly below sensitivity in the human, due of course to the hairy covering of the dog and the absence of hands.

CONCLUSION

It may be well that we repeat what we emphasized at the very beginning, namely, that this is but a roughly-sketched tho accurate discussion of the anatomy of the dog. A book can be written readily on any one of a score of parts of the dog's anatomy.

The author hopes that this brief yet correct presentation of the subject may enable dog breeders, exhibitors, handlers, fanciers, kennelmen and the one-dog or pet-dog owners, and all other dog lovers better to understand the physical needs of the dog and thereby intelligently minister to the health of the dog. Out of this knowledge can come a more sympathetic understanding of the nature, mentality and reactions of the dog.

Knowledge Brings Kindness

A full understanding of basic anatomy enables one to take measures well in advance, safeguard the health of the dog, avoid unnecessary suffering, and in not a few instances prevent entirely the oncoming of illness. Too often the dog is the victim of ignorance on the part of the master, where early attention to some plain symptom might avoid a disease or lessen its ravages, even save the life of the dog.

Body a Work of Art

The anatomy of the dog cannot help but suggest to the observant student the beauty of the design, the fitting of one part into another, the general purpose of the combined structure, and above all, the result of all these

nically combined cooperative actions resulting in life itself with its movements and its awareness of existence. Here in canine as in man, the divine plan, an outside force above and beyond the individual, is perpetually and loudly evident.

All Living Things Fight to Live

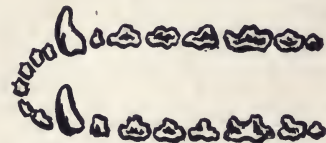
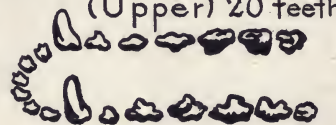
Thru the many centuries nature has donated a reserve of strength to the dog. Life itself clings tightly within the dog; it presents itself in the stamina of the vital organs and in the will to live, which, when the knowledge and skill of the veterinary no longer can aid, still carries on and often saves the day for a return to health and continued living.

"Brothers" under the Skin

May this study of the anatomy of the dog give you and all other readers an appreciation of the dog as a wonderful mechanism physically and also mentally, second only to man himself and related to the human in that the same clockmaker who wound the mainspring of the human body, set the wheels going and then closed the case forever, did likewise for the dog and all other living things.

TEETH of the DOG

(Upper) 20 teeth



(Lower) 22 teeth